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UNITED STATES

DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

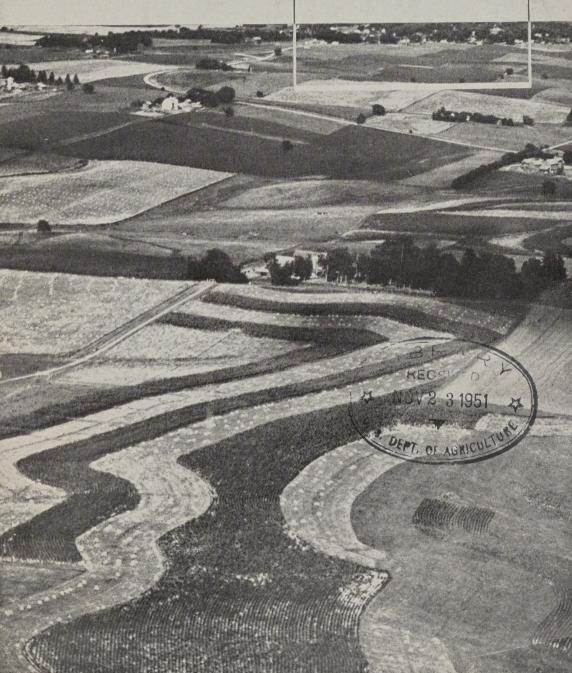
UPPER MISSISSIPPI REGION

USE THE

Land

AND SAVE THE

Soil





Neglect and abuse of the soil spell economic decline.

This publication is a brief outline of a program that will remedy or prevent damage to farms by erosion. On the back cover is a list of sources from which you can get more detailed information.

Walk over your farm and picture what conservation practices and devices you need in each field.

Conservation Farming is a good dollars-and-cents proposition.

# Soil Conservation Program for Erosion Control in the Upper Mississippi Region

(Illinois, Iowa, Minnesota, Missouri, Wisconsin)

- SOIL INVENTORY To show (1) physical condition,
   soil treatments and practices needed
- 2. DETERMINE CAUSE OF THE CONDITION
- 3. LAND USE PROGRAM
  - A. PERMANENT VEGETATION
    - 1. PERMANENT PASTURE AND HAY
    - 2. WOODLAND
    - 3. WILDLIFE COVER

- B. CROPLAND IN ROTATION
  - 1. CLEAN-TILLED CROPS
  - 2. SMALL GRAINS
  - 3. Legumes and Grasses

# 4. SUPPORTING CONSERVATION PRACTICES

- A. VEGETATIVE
  - 1. CONTOUR STRIP CROPPING
  - 2. Contour Buffer Strips
  - 3. GRASSED WATERWAYS
  - 4. COVER CROPS
  - 5. REFORESTATION

- B. MECHANICAL
  - 1. CONTOUR TILLAGE
  - 2. Terracing
  - 3. Contour Furrowing
  - 4. GULLY CONTROL
  - 5. BASIN LISTING

CONSERVATION IS UTILIZATION OF RESOURCES WITHOUT WASTE

#### THE COMPLETE PROGRAM

The principal steps to a complete program of conservation farming as outlined in the chart on page 3, are:

- 1. Know your soil.
- 2. Determine cause of the condition.
- 3. Use the land wisely.
- 4. Establish barriers against erosion.

Each of the individual practices discussed is an effective erosion-control measure. On the average farm, however, no one practice alone is enough to bring erosion under control; a combination of practices is necessary for complete protection of a farm's soil resources. Each field may need a different treatment, even parts of the same field may need different treatment.

Contour farming and strip cropping may protect some of the cultivated slopes, whereas terracing may be needed on others; or some areas may be so severely eroded that they should be converted to pasture, meadow, or timber for suitable protection. Crop rotations that include plenty of legumes and grasses to maintain fertility and organic matter in the soils are soil saving and soil improving. Grassed waterways and cover crops are recommended for all sloping fields that are cultivated. Some pastures may need complete renovation, including lime and fertilizer, whereas some need only regulated grazing. No pasture should be grazed beyond its carrying capacity. Gullies must be halted by vegetative or mechanical measures or both.

The soil conservation practices to be applied to a field will depend not only on the physical characteristics of the land—length and steepness of the slope, the type and condition of the soil, and the extent of erosion—but also on the economic requirements of the farm. A practical, complete, and effective program of soil conservation must put each acre to a use to which it is well adapted, protect the weak acres, and assist the strong acres to produce crops that will provide a living for the farm family without bringing about harmful soil losses.

#### KNOW YOUR SOIL

Before a complete program of erosion control for your farm can be planned, it is necessary to have an inventory of the soil. To get that inventory ask yourself such questions as:

How fertile is my soil?
What soil types do I have?
How deep is the topsoil?
What is the slope of the fields?
What crops will my soil grow best?

The answers to these and related questions will provide the basis for determining the reasons for the soil's condition and planning a proper land use program. To get a rough estimate of how much topsoil has been lost through cultivation some farmers have compared the depth of the topsoil in their cultivated fields with that in an adjoining cemetery, schoolyard, or virgin pasture. After a farmer has lived on his land for several years, he has learned many things about it; and it is important that he use this knowledge in applying a soil conservation program to his farm.



A farmer should measure the depth of his topsoil.

#### DETERMINE CAUSE OF ITS CONDITION

The present condition of soil as compared with that in its virgin state depends largely on past use. The soils of this region differ widely according to their origin and make-up, but most of the area that is now cultivated was fertile before it was broken. The past use of soil is generally reflected in its present condition, whether it is rich or poor, well preserved or seriously eroded.

While you are studying your soil, you are likely to discover the causes of its condition. Here are a few of the questions that you will probably ask yourself to find out why your soil is in its present condition and what needs to be done to protect and enrich it. Has land been cultivated that should never have been cleared of timber or broken out of pasture or meadow? Have the sloping fields been cropped too severely? Have water and silt from the slopes covered valuable bottom land? What has been done to prevent erosion? What crops have been grown? Have small grains, grasses, and legumes been rotated with corn to preserve the soil's productivity? Have lime and fertilizer ever been added?

Many farmers, of course, have used their soil wisely, and it remains in good condition. If you are one of these, you will want to know it. It is as important to know the things that have been done well as it is to know of the mistakes that have been made.

Farming up and down the hill is one cause of erosion.





A good example of proper land use—the steep hillsides are in timber and pasture, the slopes are strip cropped, and the waterways are left in grass.

### USE THE LAND WISELY

The more nearly a farmer uses the soil as nature intended—working with nature rather than at odds with her—the more easily he can keep his valuable topsoil at home. Acres that are badly eroded or are on hillsides and steep slopes must be protected. They may produce hay, pasture, or timber, but they cannot be expected to produce a good crop of corn. The more nearly level acres with fertile topsoil must be depended on for the heavy production.

Proper use of the land will solve the erosion problem and conserve the soil on many farms. Proper use is determined by a number of interacting factors, no one of which can be neglected if the system is to be effective, enduring, and economically sound. Soil, slope, and the degree and extent of erosion are physical factors that limit possible land use. The economic condition of the farmer, the equipment available on the farm, the cost of fertilizers, the present and future livestock needs, and the application of a rotation to a simple, effective land use plan based on these needs, are of fundamental importance.

# **Permanent Vegetation**

Steep slopes and badly eroded land should be kept in permanent vegetation. Easily erodible soils on slopes too steep for their safe cultivation can usually be most profitably used for growing hay or utilized as permanent pasture. Grazing should be so regulated that a good stand of palatable vegetation can be maintained. Some slopes may need to be fertilized and limed and reseeded before suitable pasture cover can be established.

Slopes that are too severely eroded to provide good pasture should be either planted to trees for permanent woodlands or improved and withheld from grazing until they will provide good pasture.

Grasses are not sufficient to hold soil on the steeper slopes. These should be converted to timber and should not be pastured. Pasturing of woodlands provides little feed for livestock; it injures both young and old timber stands, and it may start gullies.

Shrubs and trees on small patches of eroded land and hillsides provide food and protective cover for wildlife. Fence corners, rough gullied areas, and many out-of-the-way places can be most profitably used in this way, thus conserving not only soil but also wildlife. Small food patches of corn, sorgo (sweet sorghum), or other grains are of great benefit in carrying game birds through severe winters. These patches should be located near timber or other dense cover.

Well-managed pastures are a permanent source of income and furnish year-round cover to guard the soil on sloping land.



## **Cropland in Rotation**

Each farmer must use a certain acreage of his land in the production of clean-tilled crops. There is a natural tendency to farm intensively year after year the fields that are the most productive, or the most suitable in location, slope, and size. By too intensive cropping, with disregard for cover crops and for soil-improving crops and fertilizers, the productivity of these fields may be reduced through depletion and erosion. By diversifying crops in a balanced rotation he can improve his soil so that the same production may be secured from a smaller acreage of clean-tilled crops.

Many different crop rotations now used in this region are satisfactory for soil conservation. One of the most common is the 3-year rotation of corn, small grain, and grass-legume mixture—1 year each. Longer rotations, including more grass-legume mixtures, are desirable on much of the land in order to build up the soil and to protect it against washing. The rotation to be followed will depend on the soil type, the length and steepness of slope, condition of the soil, and the livestock needs.

This rotation of corn and grain with clover sown in the grain helps to control erosion. The wide, grassed waterways provide abundant hay crops and carry run-off away safely.



#### SUPPORTING CONSERVATION PRACTICES

Anything that checks the speed of run-off is a barrier against erosion. Trees, grasses, and other close-growing crops are the most stable checks against washing because they are living barriers with a firm foothold in the soil.

Soil improvement is an essential support to a complete soil conservation program. Limestone, fertilizers, and barnyard manure help not only to establish good plant cover but also to put the soil in condition to withstand erosion and produce higher crop yields. Barnyard manure and crop residues return mineral matter to the soil, increase its organic-matter content, and make it more absorptive. Lime and phosphate must be applied to much of the land before legumes can be grown and the rotations made effective.

With the intensive cultivation that is being practiced in this region, land use measures alone are not always sufficient to bring erosion under control on long, steep slopes in cultivation. Supporting erosion-control practices are needed to halt run-off. These practices are classified under two headings, vegetative and mechanical.



Close-growing crops seeded in row crops in the fall blanket the soil with a protective cover and prevent erosion during winter and spring months.

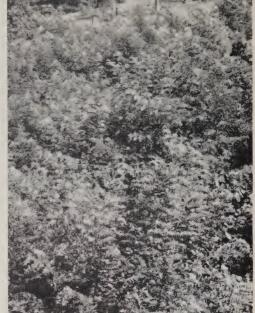


Contour strip cropping and meadow buffers on cultivated land conserve soil and water.

# **Vegetative Barriers Against Erosion**

- Contour strip cropping is farming around the hill on the level, instead of up and down the hill, and planting alternate belts of close-growing erosion-resistant crops and cultivated row crops. Run-off from the cultivated land is checked by the sod strips before it develops enough speed to cut away large quantities of soil. Strip-cropped fields may have complete crop rotations. Strips of corn, small grain, and the erosion-controlling alfalfa, clover, and grasses are rotated in the same manner that square fields of these crops formerly were. The widths of the strips usually range from 75 to 200 feet. The more erodible the soil and the longer and steeper the slopes the narrower the cultivated strips should be.
- Contour buffer strips are narrow bands of erosion-resistant crops grown at intervals across cultivated slopes. These strips remain out of cultivation permanently. The cultivated areas may be carried through a regular rotation such as corn, grain, and grass-legume mixture. The buffer strips should be wide enough to permit harvesting of hay—usually not less than 18 feet.
- Cover crops that retard erosion during fall, winter, and early spring months are needed in this region where so much of the land is cultivated and left bare after harvest. Such crops as wheat, rye, barley, or grasses make sufficient growth in the fall to furnish a cover for the soil. These cover crops also provide some pasture and if plowed under increase the amount of organic matter in the soil, thereby making it more absorptive.





Trees heal "sore" spots caused by uncontrolled erosien and put the land into a valuable crop—timber. These are pictures of the same area before and after tree planting.

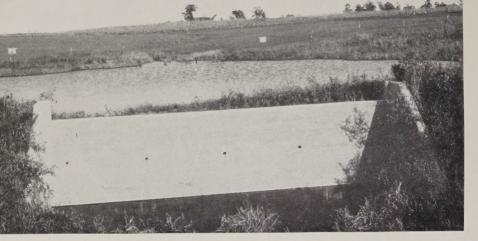
- Grassed waterways, strips of dense, permanent sod all the way down the main drainageways, will usually carry excess water away safely. They will also provide convenient places for turning and will produce excellent hay or pasture. Care should be taken to avoid cutting the sod with implements or plowing parallel to the edges. Any indentation may start a gully. The cover should be protected from overgrazing, but it should be kept low enough to prevent silting.
- Farm woodlands will provide an excellent means of holding both soil and water if they are properly managed. Many steep or badly eroded slopes are best suited to woodland. Woodlands must be protected from grazing so that the mulch of leaves will be preserved and young trees will be permitted to grow and replenish the crop as old trees are removed. Timber is a crop the same as corn or wheat. A longer time is required to obtain an income from tree plantations or from young second-growth timber stands; but when trees have once reached usable size and are properly managed, they are a permanent source of revenue. Woodlands also prevent excessive run-off and erosion from damaging cultivated fields farther down the slope.

# **Mechanical Barriers Against Erosion**

- Contour tillage—farming around the hill on the level instead of up and down the hill—is the cheapest and one of the most effective mechanical measures for checking sheet erosion on gently rolling land. There is no expense involved except for running the contour lines or rearranging fences, and many farmers can do that themselves. Contour lines can be made permanent by building field fences on the contour. The hundreds of contour rows and furrows left by farm implements are barriers against run-off and erosion. They hold back rainfall and permit much of it to soak into the soil. On the steeper cultivated slopes, contour tillage should be used in conjunction with strip cropping. Contour farming is economical not only because it saves soil and water, but also because it requires less power for operating farm machinery than up-and-down-hill farming.
- Terraces are barriers that check sheet erosion on some of the longer slopes in cultivated fields by breaking up the slopes and stopping the rush of water before it does serious damage to the soil. Terraces also prevent severe washing and silting on fields farther down the slope. They frequently are of great benefit in directing water away from active gullies and steep slopes. Excess water from heavy rainfall is carried by the terrace channel to protected outlets where it is let down safely to lower levels.

Contour tillage and terracing are good supporting conservation practices. They help to retard run-off and reduce soil losses.





Dams help to control large gullies until vegetation can stabilize them permanently.

- Contour furrows are a mechanical means of helping vegetation to protect the soil in pastures. The furrows, usually made with a plow, serve about the same purpose on pastures as terraces on cultivated land, they prevent rapid run-off and divert water away from gullies. In most pastures, however, reseeding and fertilizing to establish good plant cover will be the only erosion-control practices needed.
- Gully control, to be complete, should include treatment of both the gully and its drainage area. Vegetation should be established as quickly as possible. Keeping excess water out of a gully, by either mechanical or vegetative barriers, makes it easier for vegetation to start. Temporary dams constructed in small gullies help to hold the soil until trees and grasses become established. Permanent structures are needed in extremely large gullies to provide lasting protection against severe washing. It is necessary, of course, to bring active gullies under control, but a good soil conservation program should prevent gully formation so that control work will be unnecessary in the future.
- Basin listing is not extensively used in the upper Mississippi Valley, but it is of great benefit in those areas where soil is porous enough to absorb all the rainfall. A basin lister leaves a series of little dams of soil across each furrow. These dams form basins in the furrows that hold rainfall until it has had time to soak into the ground. If the soil is not absorptive, basin listing is harmful because the overflow from the lister furrows cuts gullies down the slope.

# CONSERVATION FARMING IS ECONOMY

Wise use of the land pays. That conservation cropping practices can maintain the same production with fewer acres in cultivation has been proved on experiment farms and demonstration projects. Proper management of pastures not only holds the soil and checks the speed of running water but also insures continued income. Retiring areas that are now unproductive permits them to become useful eventually. Those retired to trees become sources of fence posts, fuel, or timber for farm use; those retired to grass will later furnish hay or pasturage.

All resources should be utilized with as little waste as possible. Conservation of resources on the farm calls for economical use not only of soil and water but also of the products of the soil. Turning under green-manure crops, barnyard manure, and crop residues such as cornstalks, dead grass, leaves, and straw returns to the soil the minerals that are not utilized in crops or livestock products and builds up its organic-matter content. Organic matter increases the productive and absorptive capacity of the soil—makes it capable of holding larger quantities of rainfall and thereby decreases run-off and the danger of erosion. It is not economy to destroy crop residue by burning, or to lose valuable nutrients from farm manure through leaching, seepage, or weathering.

Conservation is economy. Economy in the use of products of the soil helps to maintain the soil's fertility. Economy in the use of soil and water insures productive soils for the generations to come.

The byproducts of the land should be returned to the soil to help maintain its productivity.



#### DEMONSTRATIONS OF EROSION CONTROL

The soil conservation program outlined in this publication is the basis for the demonstration activities of the Soil Conservation Service in cooperation with State agricultural colleges in Region 5. The practices discussed here may be seen on the farms of cooperators in demonstration project and C. C. C. camp areas and in soil conservation districts. They are spreading rapidly to other farms. For more detailed information and technical advice in planning a complete conservation program farmers should see their county agents or project or camp officials. The 21 demonstration projects are listed below:

#### Erosion Control Demonstration Projects

Illinois Minnesola Winona LeRoy Spring Valley Edwardsville Caledonia Freeport Faribault Twin Valley Iowa Missouri Shanandoah McGregor Bethany Marion Kahoka

Knoxville

Greenfield

Wisconsin
Coon Valley
Fennimore
Independence
Hartford

Washington

Fulton

For sale by the Superintendent of Documents, Washington, D. C. Price 5 cents

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